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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,319	03/31/2004	Xinhua Gu	IMRAA.025A	5170

20995 7590 10/13/2006

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EXAMINER	
VAN ROY, TOD THOMAS	

ART UNIT	PAPER NUMBER
2828	

DATE MAILED: 10/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/814,319	GU ET AL.	
	Examiner	Art Unit	
	Tod T. Van Roy	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07/27/2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-74* is/are pending in the application.

4a) Of the above claim(s) *6,17,18,24,26,31-41,44-46 and 51-74* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-16,19-23,25,27-30,42,43 and 47-50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

The examiner acknowledges the amending of claims 1, 7, and 49-50.

Claim Objections

The previous claim objections have been overcome.

Response to Arguments

Applicant's arguments filed 07/27/2006 have been fully considered but they are not persuasive.

With respect to claims 1, 9, and 12, the applicant has stated that Price does not teach compression of the optical pulses coupled from the mode-locked oscillator to the amplifier. The examiner does not agree with the applicant's argument. As was stated in the previous rejection to the claims, the Price reference utilizes a grating that is taught (col.8 lines 35-38) to compress the optical pulses output from the oscillator to the amplifier. This compression is further shown in fig.3a of Price. This grating performs the function of attenuating the optical pulses and thereby reduces the pulse width. To further clarify, using the claim language, the grating can be considered part of the variable attenuator system, and meets the claimed limitations.

The office action will be made non-final, in part, to account for this clarification.

Applicant's arguments, see Remarks, filed 07/27/2006, with respect to claims 19, 27, and 42 have been fully considered and are persuasive. The rejection of the claims has been withdrawn.

With respect to claims 19, and 27:

The examiner agrees with the applicant that a grating does not inherently reduce the spectral bandwidth of the confined pulse, and the rejection to the claims will be updated to include this.

With respect to claim 42:

The examiner agrees with the applicant that the combination of Price and Lin was not specific to the point of obviousness in regards to the optical tap placement and feedback to the pumping source.

Please see below for an updated rejection to the claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-5, and 7-9 are rejected under 35 U.S.C. 102(e) as being anticipated by Price et al. (US 6813429).

With respect to claim 1, Price discloses a pulsed fiber laser system comprising: a modelocked fiber oscillator outputting optical pulses (fig.1 #12, fiber span inside general

system), an amplifier (fig.1 #14) optically connected to said modelocked fiber oscillator to receive said optical pulses, said amplifier comprising gain medium that imparts gain to said optical pulses (Yb), and a variable attenuator (fig.1 in #12, composed of waveplates, gratings, and polarization beam splitters, PBS) disposed between said modelocked fiber oscillator and said amplifier, said variable attenuator having an adjustable transmission such that said optical energy that is coupled from said modelocked fiber oscillator to said amplifier can be reduced (via adjustment of the waveplates), and a compressor to compress the pulse to reduce the pulse width (col.8 lines 35-38), wherein said amplifier is configured such that attenuating said optical energy coupled from said mode-locked fiber oscillator to said amplifier reduces the pulse width (fig.3a, col.8 lines 35-38).

With respect to claim 2, Price discloses the variable attenuator to comprise polarization selection optics (waveplates and PBS).

With respect to claim 3, Price discloses the variable attenuator to comprise a polarizer (waveplates).

With respect to claims 4-5, Price discloses the variable attenuator comprises a polarization rotation element (waveplates).

With respect to claims 7-8, Price discloses the use of a grating system (col.8 lines 35-38), acting to compress the output pulses, as well as the use of chirp (col.8 lines 24-30), which implies the presence of dispersion, and in addition, teaches the use of a dispersive fiber (col.13 lines 47-51).

With respect to claim 9, Price discloses a method of producing laser pulses comprising: substantially modelocking modes of a laser cavity to produce a laser pulse (fig.1 #12), amplifying said laser pulse (fig.1 #14), chirping said laser pulse (col.8 lines 24-30) thereby changing the optical frequency of said optical pulse over time, compressing said laser pulse by propagating different frequency components of said laser pulse differently to produce compressed laser pulses having a shortened temporal duration (col.8 lines 35-38, function performed by gratings), and selectively attenuating said laser pulse prior to said amplifying of said laser pulse (fig.1 waveplates and PBS in #12) to further shorten said duration of said compressed laser pulses.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 10-16, 19-23, 25, and 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Price.

With respect to claim 10, Price teaches the method outlined in the rejection to claim 9 above, but does not teach the attenuation of the pulses to be about 1-20dB. It would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the attenuation to 1-20dB as it has been found to be within the skill of a general worker in the art to discover the optimal or working range via routine experimentation (see MPEP 2144.05 II - "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)).

With respect to claim 11, Price teaches the method outlined in the rejection to claim 9 above, including proper polarization maintenance from the compressor to the amplifier (fig.1 lambda/2 waveplate), but does not teach the amplifier to be output to the compressor. It would have been obvious to one of ordinary skill in the art at the time of the invention to place the pulse compressor at the output of the amplifier, rather than the input, in order to correct for any pulse broadening effects due to anomalous dispersion, or defects, found within the fiber amplifier span.

With respect to claims 12, and 15-16, Price teaches modelocking a fiber based oscillator that outputs optical pulses (fig.1 #12), optically coupling an amplifier to said fiber based oscillator through a variable attenuator (fig.1 waveplates and PBS) so as to feed said optical pulses from said fiber based oscillator through said variable attenuator to said amplifier, including measurement of the optical pulse characteristics (col.13 lines

40-67) and controlling the pulses as a function of pump radiation power, chirp, and amplifier length. Price does not teach adjusting the variable attenuator to reduce the intensity of the pulse delivered to the amplifier. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the stated pulse controls with an additional attenuator control in order to add further refinement capability to the system allowing for even greater output pulse modification.

With respect to claim 13, Price further teaches the use of a pulse compressor (col.8 lines 35-38).

With respect to claim 14, Price teaches the compressed and amplified optical pulses to have a duration of 67fs (col.13 line 60), but do not teach the average power to be about 200mW. It would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the output power to about 200mW as it has been found to be within the skill of a general worker in the art to discover the optimal or working range via routine experimentation (see MPEP 2144.05 II - "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)).

With respect to claims 19-21, and 23, Price teaches a pulsed fiber laser comprising: a modelocked fiber oscillator (fig.1 #12 fiber span inside general system) producing an optical output comprising a plurality of optical pulses having a pulse width and a spectral power distribution having a bandwidth (inherent), an amplifier optically connected to said modelocked fiber amplifier for amplifying said optical pulses (fig.1

#14), and a grating disposed to receive said optical output of said modelocked fiber oscillator prior to reaching said amplifier (col.8 lines 35-38, only allowing for substantial reflection of the frequency regime that matches to the grating pitch and dimension), said grating having a spectral transmission with a band edge that overlaps said spectral power distribution of said optical output of said modelocked fiber oscillator (inherent for Price's system to function). Price does not teach the grating to act as a filter to reduce the spectral bandwidth. It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the compression gratings as a filter in order to allow for transmission of only a specific frequency range, filtering out unwanted frequencies and reducing the spectral bandwidth, as is well known and widely practiced in the art.

With respect to claims 22 and 25, Price discloses the spectral bandwidth of the filter to be between about 5 and 12nm (fig.3b 18nm is about 12nm, see MPEP 2144.05 I).

With respect to claim 27, Price discloses a method of producing compressed optical pulses comprising: substantially modelocking longitudinal modes of a fiber resonant cavity so as to produce a train of optical pulses (fig.1 #12) having a corresponding spectral power distribution with a spectral bandwidth, amplifying said optical pulses (fig.1 #14), compressing said optical pulses to produce compressed optical pulses (col.8 lines 35-38). Price does not teach the grating to act as a filter to reduce the spectral bandwidth. It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the compression gratings as a filter in order to allow for transmission of only a specific frequency range, filtering out unwanted

frequencies and reducing the spectral bandwidth, as is well known and widely practiced in the art.

With respect to claim 28, Price discloses the spectral bandwidth is reduced prior to amplifying said optical pulses (col.8 lines 35-38, gratings before amplifier).

Claims 29-30 are rejected for the same reasons stated in the rejection to claim 22 above (i.e., 18nm is about 12 and about 10nm).

Claims 42-43, and 49-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Price in view of Horvath et al. (US 6693927).

With respect to claims 42-43, and 49-50, Price teaches the laser device outlined in the rejection to claim 1, as well as the rearrangement of compressor and amplifier (see claim 9), and the importance of pump radiation power in regards to pulse characteristics (col.13 lines 40-67). Price does not teach (i) an optical tap between said modelocked fiber oscillator and the fiber amplifier, including a feedback loop from the tap to control the fiber oscillator based on a measurement from the tap or (ii), a second optical tap between the amplifier and the compressor, including a feedback loop from the second tap to control the amplifier based on a measurement from the second tap. Horvath teaches a laser system employing mode-locking wherein an optical tap (fig.2 #65) is used after both of the amplifier and oscillator portions (from output) to measure the output and make adjustments to the pumping source. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the pump control

teaching of Price with the pump control feedback loop of Horvath to either the amplifier or oscillator pumps (i.e. placing a feedback loop after the oscillator back to the oscillator pump, or after the amplifier back to the amplifier pump) to allow for active control of the output pulse characteristics.

Claims 47-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Price in view of Horvath, and further in view of Hu et al. (US 6901085).

With respect to claims 47-48, Price and Horvath teach the pulsed laser system outlined in the rejection to claim 42 above, but do not teach the use of isolators near to the optical taps. Hu teaches a fiber system wherein an isolator is utilized in the optical path by a tap (fig.2). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the system of Price and Lin with the isolator of Hu in order to eliminate the possibility of back reflection of light at the optical tap insertion points.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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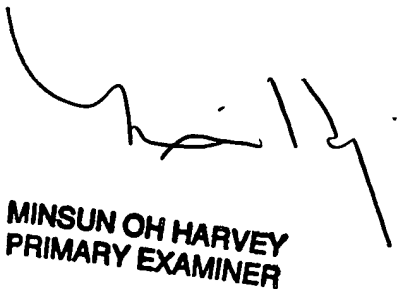

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